Turning first to the rejection of claims 6 and 7 under 35 U.S.C. §112, second paragraph, and the Examiner's indication that it is not clear if the gate electrode film or the oxide film is limited to a thickness of 6 nm, that it is not clear which film is etched, and it is not clear if the ending "....and is also time modulated" is a limitation that requires the time modulation of the plasma generating power source in addition to the modulation of the bias power supply. Applicants note that by the present amendment, claim 1 has been amended to incorporate the features of claim 6 therein in a manner which clarifies the features of claim 6 with claims 6 and 7 being amended to depend from claim 1 and to clarify the features thereof.

More particularly, claim 1 has been amended to recite a method of treating a surface of the sample having a gate electrode film and a film underlying the gate electrode film and provided on a Si substrate, noting that such feature is illustrated in Fig. 5, for example, wherein the gate oxide film 502 underlies a polysilicon film 503 which forms a gate electrode of a MOS transistor, for example, and is provided on a silicon substrate 501, as described at page 11, line 11 et. seq. of the specification, noting that Fig. 16(d) illustrates the profile of the sample as obtained by etching treatment in accordance with the present invention. More particularly, page 3, lines 7-23 of the specification, describes the requirement for an electrode of a minimum feature size of 1 μm or smaller and a thickness of a gate oxide film of 6 nm or smaller. See also the Summary of the Invention at page 4, line 10 to page 6, line 5 of the specification. In accordance with the present invention as illustrated in Fig. 2, the rf bias is on-off modulated at a frequency of 100 Hz to 10 khz to perform etching treatment of the sample having the recited features as set forth in claim 1 and the dependent claims. As described at page 25, line 24 et. seq., by applying the on-off bias modulation to the processing of the main part of the sample as a substance to be etched, a desired processing can be performed without damaging the very thin underlying film, and as disclosed, and as now recited in claim 1, the gate electrode

film having a film underlying the gate electrode film and provided on a Si substrate is etched in the manner described, whereby a minimum feature size of the gate electrode film is 1 μm or smaller and a thickness of the underlying film is 6 nm or smaller. Applicants submit that these features of claim 6 have been incorporated into claim 1 and claim 1, and likewise claim 6, as amended, should be considered to be in compliance with 35 U.S.C. §112, second paragraph.

As to the rejection of claims 1, 2, 4 and 5 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,093,332 issued to Winniczek et al and the rejection of claim 3 under 35 U.S.C. 103(a) as being unpatentable over Winniczek et al further in view of U.S. Patent 5,378,311 issued to Nagayama et al, such rejections are traversed insofar as they are applicable to the present claims, and reconsideration and withdrawal of the rejections are respectfully requested.

At the outset, as to the requirements to support a rejection under 35 U.S.C. 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

With regard to the requirements to support a rejection under 35 U.S.C. 103, reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988),

wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Furthermore, such requirements have been clarified in the recent decision of In re Lee, 61 USPQ 2d 1430 (Fed. Cir. 2002) wherein the court in reversing an obviousness rejection indicated that deficiencies of the cited references cannot be remedied with conclusions about what is "basic knowledge" or "common knowledge". The court pointed out:

> The Examiner's conclusory statements that "the demonstration mode is just a programmable feature which can be used in many different device[s] for providing automatic introduction by adding the proper programming software" and that "another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial" do not adequately address the issue of motivation to combine. This factual question of motivation is immaterial to patentability, and could not be resolved on subjected belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher."... Thus, the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion. (emphasis added)

At the outset, applicants note that claims 6 and 7 have not been rejected over the cited art and the features of claim 6 have been incorporated into claim 1, as indicated above. Thus, applicants assume that since the Examiner did not reject claims 6 and 7 over the cited art, the features of claim 6 incorporated into claim 1 reciting the sample as having a gate electrode film and a film underlying the gate electrode film and provided on a Si substrate with the sample being subjected to etching treatment by on-off modulation in the manner defined in which a minimum feature size of the gate electrode film is 1 μm or smaller and a thickness of the underlying film is 6 nm or smaller, are recognized by the Examiner as patentably distinguishing over the cited art and claim 1 and the dependent claims should be in condition for allowance.

Turning to Winniczek et al, applicants note that the Examiner contends that Winniczek et al teaches a method directed to the etching of sub-micron features into substrates. Applicants note that Winniczek et al relates to a method for reducing erosion of a mask while etching a feature in a first layer underlying the mass. While the underlying layer may be of different forms including a dielectric layer, a polysilicon, metal, or the like, there is no disclosure or teaching in Winniczek et al of etching a sample having a gate electrode film, a film underlying the gate electrode film, and provided on a Si substrate, while performing etching so as to obtain a minimum feature size of the gate electrode film of 1 μm or smaller while a thickness of the underlying film is 6 nm or smaller. Thus, irrespective of the teachings of Winniczek et al, applicants submit that this patent fails to disclose or teach the claimed features of claim 1 and the dependent claims of this application in the sense of 35 U.S.C. 102 or 35 U.S.C. 103 and claims 1 and the dependent claims 2-7 should be considered allowable thereover.

With respect to the dependent claims, applicants note that claim 2 recites the feature of the plasma having an electron density of $1 \times 10^{10} cm^{-3}$ or higher and

applicants submit that such feature is not disclosed or taught by Winniczek et al in the sense of 35 U.S.C. 102 or 35 U.S.C. 103. Claims 4 and 5 recite additional features which are not disclosed by Winniczek et al in the sense of 35 U.S.C. 102 and/or 35 U.S.C. 103, such that applicants submit that these claims also patentably distinguish over Winniczek et al and should be considered allowable thereover.

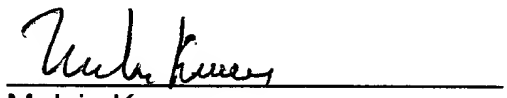
As to the rejection of claim 3 based upon the combination of Winniczek et al and Nagayama et al, applicants note that the Examiner has recognized that Winniczek et al does not disclose or teach that the etchant is a mixture of chlorine and oxygen, but contends that since Nagayama et al teaches using an etchant that is a mixture of chlorine and oxygen, it would be obvious to utilize the same therein. Applicants submit that this position by the Examiner represents the principle of "obvious to try" or utilizing common knowledge which has been rejected by the courts. See In re Fine, supra and In re Lee, supra. Moreover, applicants submit that Nagayama et al is directed to discharging of an electrostatic chuck and is not directed to etching of a sample having a gate electrode film, with an underlying film provided on a Si substrate with the features as recited in claim 1 and the dependent claims. As such, applicants submit that claim 3 as well as parent claim 1 patentably distinguish over this proposed combination of references in the sense of 35 U.S.C. 103 and should be considered allowable thereover.

In view of the above amendments and remarks, applicants submit that all claims under consideration herein, i.e. claims 1-7, are in compliance with 35 U.S.C. §112, and patentably distinguish over the cited art and should now be in condition for allowance. Accordingly, issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing

of this paper, including extension of time fees, to Deposit Account No. 01-2135 (520.36911VX1) and please credit any excess fees to such deposit account.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Page 19, please amend the paragraph beginning at line 15 as follows:

A physical quantity which directly exerts an influence on the depth of the microtrench and the selectivity does not relate to the amplitude of Vpp, but relates to the ion energy. Since it is difficult to measure the ion energy in practice, the amplitude of Vpp is used as an index of the ion energy. The relation between the ion energy and the rf voltage will now be described. When the rf voltage is applied to the stage via a plasma, a DC potential (hereinbelow, referred to as "Vdc") is so generated as to attract ions into the stage by causing a current to flow between the earth (generally, a conductive wall serves as the earth) and the electrode. The ions are accelerated by an electric field obtained by overlapping Vdc and the rf voltage which changes with time. The maximum ion energy which can be obtained varies depending on whether the motion of the ions follows the change with time of the rf voltage. Generally, the density of a plasma used for etching is equal to or higher than $1 \times 10^{10}/cm^{-3}$. With such a density, the ions travel through the plasma sheath and reach the sample during the period in which the rf voltage is negative, that is, during a period of ½ of the sine wave when the rf bias frequency is 15 MHz or lower. Emax is therefore almost equal to a value obtained by adding Vdc to the value of ½ of the voltage amplitude (Vpp/2). In reality, there is a voltage drop or the like in an electric circuit. It is known from measurement that Emax is 400 eV when Vpp is 500V. Since a substantial physical quantity which exerts an influence on the etch profile is not Vpp but the ion energy, in order to obtain a profile without any microtrench, it is sufficient to set the maximum value of the ion energy to 400 eV or higher. When the frequency of the rf bias increases and the motion of the ions does not follow the change in voltage, Emax gradually approaches Vdc. A period during which the frequency is from 15 MHz to a few tens of MHz is a transient period. In

such a case as well, if Vpp is set to 800V or higher, Emax sufficiently becomes 400 eV or higher.

Page 26, please amend the paragraph beginning at line 14 as follows:

The structures of plasma etchers to which the invention can be applied will be described. Since the invention aims to process a device whose minimum feature size is 1 μm, preferably, 0.5 μm or smaller, the effects are displayed when the invention is applied to a machine of a so-called high-density type in which the plasma electron density is $1 \times 10^{10}/cm^{-3}$ or higher, preferably, $1 \times 10^{11}/cm^{-3}$ or higher. As plasma etchers of this type, there are an inductively coupled plasma etcher and an ECR etcher. A capacitively coupled plasma etcher, which has been known for a long time, has problems as described below and is not adapted to the invention. Since such an etcher cannot generate a high density plasma, the throughput is low. Since the plasma density is low, the sheath becomes thick and the ions are scattered in the sheath, thereby deteriorating the degree of anisotropy. Since the plasma cannot be generated in a region where the gas pressure is low, the ions scatter considerably.

Page 37, please amend the paragraph beginning at line 21 as follows:

By using a high density plasma having an electron density of the plasma of $1 \times 10^{10}/cm^{-3}$ or higher, an etching having a high throughput can be carried out.

IN THE CLAIMS:

Please amend claims 1, 2, 4, 6 and 7 as follows:

1. (amended) A method of treating a surface of a sample having a gate electrode film and a film underlying the gate electrode film and provided on a Si substrate, comprising the steps of:

arranging ~~a~~ the sample on a stage provided in a chamber;

continuously supplying an etching gas into the chamber and generating a plasma from the etching gas;

applying an rf bias at a frequency of 100 kHz or higher to the stage independently of the generation of the plasma; and

on-off modulating the rf bias at a frequency of 100 Hz to 10 kHz to perform a ~~surface~~ etching treatment of the sample in which a minimum feature size of the gate electrode film is 1 μm or smaller ~~to the sample~~ and a thickness of the underlying film is 6 nm or smaller.

2. (amended) A method according to claim 1, wherein the plasma is a high-density plasma having an electron density of $1 \times 10^{10}/cm^{-3}$ or higher.

4. (amended) A method according to claim 1, wherein the step of arranging ~~a~~ the sample on a stage includes holding the sample on the stage by electrostatic chucking, the sample being treated by applying the rf bias to the stage independently of the plasma generation and time modulating the rf bias.

6. (amended) A method according to claim 1, wherein the ~~sample has a~~ underlying film ~~made of a material serving as a~~ which underlies the gate electrode ~~on~~ film is a gate oxide film ~~having a thickness of not greater than 6 nm is etched with the plasma and is also time modulated~~.

7. (amended) A method according to claim ~~6~~ 1, wherein the gate electrode film ~~made of the material serving as the gate electrode~~ is a polysilicon film or a multi-layered film including a polysilicon film.